Final Public Report for ESA-030, Solvay Chemicals

Introduction:

Solvay Chemicals manufactures soda ash. The company uses low temperature Trona-calciners (4), soda ash dryers (2) natural gas fired, and steam boilers (coal fired). Two trona-ore calciners use coal and two, use natural gas. These calciners were converted from gas fired to coal fired in 2006.

A series of refining steps are required to produce soda ash from trona ore. First the raw ore from the mine is crushed and screened. The material is then fed to gas-fired rotary calciners and heated. In this process, the trona decomposes to form crude soda ash.

The calcined soda ash is dissolved in water. The insoluble shales are separated from the solution by a combination of settling and filtration steps. The resulting insoluble tailings are taken back into the mine as backfill. The soda ash solution is treated to remove organic materials. This series of processing steps yields a high-purity saturated solution of sodium carbonate.

The solution is fed to the evaporator/crystallizers where water is evaporated and sodium carbonate monohydrate crystals are formed. The industry-familiar term “mono-process” originates from this process step. The crystals are dewatered and washed using cyclones and centrifuges. The dewatered solution is recycled to the evaporator units for further recovery of soda ash.

The monohydrate crystals are fed to dryers (steam-heated in the original plant and gas-fired in the expanded plant) where they are dried to the finished product of soda ash. Product is screened and sent to storage silos awaiting rail and truck transport.

Objective of ESA:

The objective of this Process-Heating assessment was to provide the tools for supporting the plant goals of improving production and reducing fuel-fired consumption.

Focus of Assessment:

The energy assessment focused primarily on the Calciners (gas-fired and coal fired) and the dryers (gas fired). The following units were selected for the assessment: Calciners CA-2 (coal fired) and CA-4 (gas fired), and Dryer DR-6 (gas fired).

Approach for ESA:

The Plant Leads and the DOE-expert had a walk-through the plant and specific EAS targets were identified. Prior to the ESA, the Plant Leads collected all the necessary data, thence, during the assessment, the DOE-expert and the Plant Leads entered the plant/equipment data in the PHAST program and a furnace analysis was performed. While performing the heat balance, the DOE-expert discussed possible steps that could be taken for improving the process-heating system performance. These suggestions were discussed with the Plant Leads who made observations about their feasibility of implementation. The results from the discussion yielded a list of potential opportunities for energy savings, described next. During the third day of the audit, the Plant Lead presented the results during the closeout meeting to the plant management.

General Observations of Potential Opportunities:

Potential opportunities for optimizing the process heating performance by reducing the burner capacity of the dryer as well as reducing excess air content of flue gases to the suggested by manufacturer in both, the gas-fired and coal-fired calciners were observed. Preliminary sense of 3% of total energy cost savings could result from the ESA.

Recommendations:

- Load or charge preheating using heat from flue or exhaust gas or other source of waste heat (Calciner CA-4). We would like to raise the temperature of the load (trona-ore) from 70^{o}F to at least 100 ^{o}F using exhaust temperature of flue gases. The potential fuel savings is 2.6%.

- Downsize the capacity of the Dryer DR-6. We expect that this reduction will allow to bringing the oxygen in flue gases from 12% to the value recommended by manufacturer of 8%. The potential fuel savings is 3.2%

- Calciner CA-2: heat recovery to increase temperature load (coal fired). The potential fuel savings is 4.6%

Management Support and Comments: "This was a good review and analysis of the plant energy needs and opportunities. One significant result was the prompting of a review of the material and energy balance of gas dryer DR-6, which in turn led to an investigation of the gas flow measurement equipment."

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